MERRITT
Communications, Inc.
ENVIRONMENTAL SOLUTIONS DIVISION
340 WOODLAND STREET, HOLLISTON, MA 01746-1824, USA

Framingham State College

Summary of Current Waste Management and Recycling Program And Recommendations for Increasing Diversion

Prepared for:

The Executive Office of Environmental Affairs

By:

Jennifer Hyde and John Merritt

June 2003

Project Basis:

The Massachusetts State Sustainability Program of the Executive Office of Environmental Affairs has funded this project. The first project goal is to examine solid waste and recycling efforts at college and university campuses throughout the State, with respect to meeting the recycling goals waste bans promulgated by MA DEP. Based upon that review, proposals are made for incremental improvement in waste management and recycling practices to increase diversion of materials and reduce disposal in a most cost-effective fashion.

For additional information on the State Sustainability program please contact:

Eric Friedman, Director of State Sustainability, 617-626-1034
Jaclyn Emig, State Sustainability Project Manager, 617-626-4910

Framingham State College:

Framingham State is a suburban college with typical administrative and classroom buildings as well as residence halls. Staff, responsible for recycling and solid waste management, is committed to maximizing recycling diversion, consistent with financial and staffing constraints. A wide variety of materials are collected from many locations throughout campus. Improving the mixed paper and cardboard diversion throughout campus and adding commingled containers in administrative buildings and in residence buildings, on a pilot-project, trial basis represents the clearest path to immediate increase in diverting recyclable materials from disposal. Obtaining contracts that allow better management of disposal collection and disposal costs are also an important part of improving the over-all waste management profile on campus. If expenses for waste management can be reduced through adjustment of contracts and consolidation of waste containers, additional funds would be available to fund additional recycling activities. Because of the near autonomy of the food service at this campus, changes have not been recommended for containers and collection schedules currently used at that location. The following summarizes our findings and recommendations.

Summary of Key Recommendations:

1. Reduce MSW compactors from 35 cu. Yds. to 20 cu. Yds and collections from 52 per year to about 21 collections per year on an on-call basis.
2. Add six collections per year for the dome topped mixed paper recycling container.

Summary of Predicted Program Benefits

1. Recycling percentage increases 16.7% from 18% to 21% of all material managed.
2. One year savings of about $8,700 overall.

3. Average cost for managing a ton of MSW drops from about $55.75 to about $48.25.
4. Average cost for managing a ton of recycled material drops from about $33.50 to about $30.50.
5. Average cost for managing a ton of combined materials is reduced from about $51.75 to under $45.

.

Solid Waste Management Practices:

Waste Management and Recycling Vendor:

B-P Trucking, Inc
Contact: 508-231-1000, fax: 508-881-6123

Contract Start date 07/01/2003
Contract End date 06/30/2005

Equipment, Collection Schedule and Contract costs:

1. **MSW**, in 2-35 cu. Yd. compactors located behind library,
   $150/compactor/month- rental = $3,600/year
   $100/pickup/compactor = $10,200/year
   $78/ton tip fee
   Total disposal: $16,772/year

2. **MSW,** in 1-15 cu. Yd. compactor, collected 5 days/week for 39 weeks, bi-weekly for 13 weeks, located behind the College Center, at the food service.

   15 cu. compactor: $1,948/month flat rate; $18,993/year

- **Bulky waste,** in 1-30 cu. Yd. container, collected twice per month

3. **Recycling**,
   OCC (Old corrugated cardboard): Collected in 2-2 cu. yd. containers behind College Center, collected 5 days/week for 39 weeks, bi-weekly for 13 weeks

   Lease – 2 cu. Yd. containers (2) $24/month for both $288/year;
   Collect – 2 cu. Yd. containers (2) $144/month for both, $1,728/year

OCC in 1-10 cu. yd. container located at "recycling center" behind library with 2 MSW compactors, collected weekly, plus 4 additional collections.

Lease – 10 cu. Yd. container $24/month, $288/year
Collect – 10 cu. Yd. container $20/each, $1,200/year

Mixed paper: Mixed paper is defined as: all colors and stocks of uncontaminated paper and paperboard, but at FSC does not include OCC. Collected by vendor in 1-30 cu. Yd. container, collected on-call, approximately twice a month.

Lease – 30 cu. Yd. container $90/month, $1,080/year
Collect – 30 cu. Yd. container $100 each, $2,400/year

23 gal "slim jim" bins are located in 15 computer labs and 28 qt desk side containers are provided to college office workers. FSC's recycling coordinator does not believe that all office workers have these deskside containers (although it is not known how many are needed.) 42 custodians or "maintainers" go to each office, deposit trash into black bags, recycling into clear, 1 day/week dedicated to recycling collection (Wednesdays) Pickup trucks are used to deliver bagged materials to centralized rolloff containers.

Other materials:

Mattresses: 75-80/yr to Conigliaro Industries for dismantling and recycling
Monitors/TVs/Fluorescent Bulbs- Onyx
Appliances- BFI
Organics - The contractor reports that all yard waste, brush, etc. is delivered to local nurseries for use as mulch and compost facilities. Tree limbs and branches are ground and used as wood chips and No green waste is delivered to landfills.

Key Issues to be Addressed:

- FSC recycling coordinator believes that higher levels of mixed paper/OCC diversion is possible
- There is no recycling access for students (and teachers) in classrooms (except paper near/in computer labs) or in residence halls (except one paper bin near mailboxes). When the school has placed containers in these locations in the past they experienced extreme levels of contamination and vandalism.

- Volunteer efforts in the past to include students in the planning and monitoring of program have failed due to lack of follow through from students.
- The cost for MSW collection and disposal appear to be high based upon utilization profile indicated in the Waste Management Tracking Model developed specifically for this school. (Attachment A)

Costs of Solid Waste Collection

With respect to solid waste, FSC disposes almost 1,000 tons per year. The total cost for solid waste collection and disposal is $55,468, resulting in a per ton cost of about $55.75 for collection and disposal of solid waste, including bulky collections.

Estimates of recycling rates:

Using the annual waste tonnage, from the prior year, used by the current vendor in the bid documents and estimating full OCC containers, the base case estimate shows Framingham State College recycling about 212 tons of paper annually, representing a recycling rate of 18%. Based on recent research, paper represent about 31%[1] of the pre-recycling educational institution waste stream. So, based on estimates in the absence of unit-based recycling data, FSC is recycling about 58% of the available paper.

So, again, the first step necessary for FSC to improve their existing program is establishing waste management and recycling services agreements that offer both unit based pricing and clear reporting of material generation and management data for all managed materials. In addition, an on-call collection basis, rather than scheduled, may allow some reduction in collections necessary or the use of smaller containers. This should result in a reduction in fees.

Cost of Existing Recycling Program

In any event, the total current cost for the recycling program is $6,984, resulting in an average recycling cost of about $33/ton.

Contract Evaluation

CONTRACT TERMS

[1] ***Advancing Resource Management at Fitchburg State College*** (Fitchburg, MA), Tellus Institute for Mass. DEP, January 2002; cites: By weight (before recycling), based on waste stream profiling performed by Harvard University in 2000 and supported by California Integrated Waste Management Board Waste Composition study http://www.ciwmb.ca.gov/WasteChar/BizGrpCp.asp - educational institution data.

Current contract terms, as detailed above, are typical for compactor-leased commercial MSW service, as well as for container provision and collection service at the food service location and the twice-monthly bulky waste management.

GENERAL SUGGESTION FOR CONTRACT IMPROVEMENT

However, the compactor portion of the contract, when broken out, seems to be substantially more expensive than necessary. As the Tracking Model shows that the 214 or so tons disposed over the course of the year is at least a 50% under-use of leased compactor capacity. A large part of the problem is that collections are scheduled on a regular basis, rather than on an "on-call" basis, which would accommodate variation in output. It also appears that 20 cu. yd. compactors could be substituted for the 35 cu. Yd. compactors currently in use.

SUGGESTION FOR CONTRACT IMPROVEMENT

Since B-P Trucking is already one of 35 solid waste services vendors, qualified as contractors under Mass OSD's statewide contract (ST1J391) for waste removal and recycling services, it should be possible to switch to "on-call" services. Contract ST1J391 requirement #11 requires that: *All contractors must agree to **reduce collection** frequency at department facilities at any time during the agreement period should a facility request such a reduction as a result of greater recycling and/or waste prevention activities. Such reductions in collections should result in associated reductions in price.* It is likely that smaller compactors and/or an on-call collection system would be more cost-effective for Framingham State.

In addition, the food service management is all contracted on a lump sum basis with no ability to learn how many tons at what unit cost are being managed. It is, therefore, impossible to know with certainty the cost per ton being managed in this fashion.

Once again, OSD's contract, ST1J391, would provide a solution. Requirement #10 requires that: *Contractors must submit **semi-annual statewide reports** to the PMT and must submit individual facility reports upon request which details the quantity of materials disposed of and/or recycled during the previous 6 months*. The contracts language does not specify that "weight" be provided, but the school should request from the contractor to receive reports including weights. If the contractor proves unable to do so, volumes may be the only measure of quantity that the contractor can provide. However, if the "on-call" collection approach were adopted and containers were a known percentage full when hauled, reasonable weight estimates can be made from industry volume to weight conversions. This will require some monitoring of the containers over several months to estimate percent full of dumpsters when collected. If weight slips could actually be negotiated with the vendor, that would be the ideal circumstance.

While the estimated generation, disposal and cost of management per estimated ton numbers are not unusual at FSC, lump sum pricing with no firm weight records for the

waste collected at the food service is a weak point. Whatever the program diverts today, there should continue to be an interest in finding improvements. Having unit prices for disposal and container services for all elements of the program, as well as accurate quantity/weight records for material flow are an important tool in accomplishing that.

Recommendations to Upgrade Recycling Program:
MSW:

1. Reduce size of compactors from 35 cu. yds. To 20 cu. yds. Based on the models, these smaller sized compactors should be more than sufficient to handle projected quantities of MSW and will free up some additional space.
2. Reduce compactor collection from 52 to approximately 21 per year on an "on-call" basis. Reductions in number and sizes of compactors will have cost benefits to the college, which can be applied to increasing the recycling program activity.
3. Develop system for better record keeping, having records by weight of MSW disposed and a unit disposal cost across the board, rather than flat rates for multiple services, provides a much stronger tracking and management system then the one currently in place. Work with the contractor to accomplish this, reminding them that providing records For a two month trial period, establish a visual tracking system to determine the percent full of containers to better understand the real cost of disposal.

Recycling

1. Add 6 additional collections of the 30 cu. yd. dome top mixed paper collection container. This would cost an additional $100 per collection, totaling $500 per year. However, the savings in reduced MSW collection costs more than offset the additional costs.
2. Increase OCC and mixed paper diversion by providing paper collection bins scaled to desk side (14 gal) use in all administrative areas. These small blue recycling bins are typically used in office settings and highly recognizable to people as a reminder to recycle. Their convenient location next to people's desks will encourage additional diversion. The college aims to ensure that every office worker has one beside their desk. Since it is not now known how many desks lack recycling containers, the first step would be to do a rough survey. A student intern or work study student could make a ball park guess by surveying several administrative buildings.
3. Provide maintenance staff "piggy-back" paper collection bins to take from office to office when collecting general waste. This type of collection system allows the maintainers to collect recyclables and MSW in the same trip.
4. Consider using "work study" student assistance to regularly pass through student living areas and classrooms with wheeled bins sized for easy handling to collect and divert OCC and mixed paper in a fashion that does not leave any containers or materials out and available for vandalism. As well these students could also be used to monitor the program for signage on the recycling containers and posters

throughout the campus. Because these students are paid for their work this should eliminate the problem the school has had in the past recruiting student volunteers who have showed initial interest, but lacked follow through. Students and staff could be recruited to make announcements about the recycling program at meetings where such an announcement would be appropriate.

5. Institute an outreach and education program regarding the existing paper recycling program and any enhancements to recycling. Using the school's emailing infrastructure for quick announcements about the recycling program, is an effective and time efficient technique for getting the word out. As well, an updated poster and flyer campaign is always helpful to reinvigorate the program. This type of publicity campaign is time and resource intensive, so it can only be easily undertaken if there are sufficient funds available after the increased recycling collections are put into place and student help is available to support the campaign.
6. Explore possibility of doing a "Dump and Run" type dormitory reuse effort at end of academic year. Staff indicated space problems, but it would be advised to set up initial consultation with a "Dump and Run" type organization who has experience in working with institutions (like Harvard University) that have very significant space constraints and have successfully achieved high diversion through such a program.

Spreadsheet Tracking Model

The consultants have developed spreadsheet tracking models to assist the school's planning staff in attaining the optimal cost scenario for their existing or planned recycling and solid waste management programs. This tool should prove enormously helpful in assisting schools to make the necessary adjustments in targeted materials, containers, vendors, etc., to achieve the highest possible diversion at the lowest possible cost.

The models work as follows:

The tracking model is an Excel workbook, consisting of three primary worksheets, followed by a series of additional worksheets that could be employed to address additional expense or revenue items like amortizing purchased equipment or generating an equipment replacement fund. Any additional expense or revenue issues could be added to this model in the future as required.

The first worksheet includes basic data about the existing program and circumstances, such as the rate of inflation, the densities of different materials and the current revenue per ton for recyclable materials. These assumptions can be changed, if necessary, due to changing circumstances over time. In addition, on the first worksheet, there is an extensive input matrix, with each data input item highlighted in yellow.

This matrix provides spaces to profile current or future container and collection schedules for waste and for recyclables. For each container type, there are input spaces for: # of

containers, the size, collection schedule and known fees for collection, container leases or disposal, percent full when collected.

For the first year, we have attempted to capture, as accurately as the available data allows, what the current circumstances are for all containers for all materials. This column represents the "base case." The power of the model lies in its capacity to allow "what-if" estimates for future years, by varying any of the input variables highlighted in yellow.

Using the data and assumptions described above, the first worksheet calculates the following:

Total waste collection cost
Total waste disposal cost
Total tons of waste disposed
Total recycling cost
Tons of mixed paper recycled
Tons of OCC recycled
Tons of commingled containers recycled
Total waste and recyclable material generation in tons
Recycling percentage
Annual mixed paper revenue
Annual OCC revenue
Annual commingled revenue

The second worksheet of the model is a Budget Summary pro-forma, which takes data from the assumptions and data sheet and breaks out the financial implications of the base case, as well as any what-if scenarios. In addition to restating the total expenses for waste collection and disposal as well as recycling programs, this worksheet breaks out the cost/ton to manage waste, cost/ton to manage recyclable materials and combined cost/ton for all materials. If revenues are relevant, the revenue stream is also captured. Finally, the annual total for all waste and recycling activities is calculated, as is a three-year total.

Therefore, as container sizes, collection schedules or fees are changed, the impact on total recycling percentage, cost, cost/ton for waste and recyclables management can be easily seen. This allows the opportunity to establish hypothetical cases and compare the costs and volumes managed to the current base case. As years pass, the model continues to sharpen each current case, while providing more accurate predictions for possible future cases. When each year has passed, comparing actual results to what had been predicted a year or more earlier allows one to easily assess the degree to which performance expectations have been met or where changes may still be needed. In any event, each campus will have a clear and accurate picture of volumes of materials being diverted and disposed, as well as all costs related to those activities.

Finally, the third worksheet is the summary of the current recycling and waste management contract terms at the school.

Environmental and Cost Benefits of Implementing Recommendations:

1. Increased OCC and mixed paper diversion is likely to reduce the MSW heading to the landfill or incinerator. This has both a financial and environmental benefit in resource savings (trees, energy, water).
2. There is a savings in landfill capacity, which is at a real premium especially here in Massachusetts. Much MSW is shipped out of state, which has a huge cost both financially and environmentally. By diverting material from the incinerator, results in a net reduction in potentially harmful air emissions
3. The proposed changes result in an estimated increase in recycling rate of 16.7%, rising from 18% to 21% of all material managed.
4. The proposed changes result in an estimated decrease in disposal of over 40 tons, from 995 to 955 tons.
5. The proposed changes result in an estimated net savings of about $8,700, after the cost of additional collections and containers covered by the estimated savings in disposal.
6. Base Case - Data interpretation: (***Please refer to Attachment A – Worksheets One & Two***). The current situation or "base case" is reflected in the first column, throughout the model. This column includes all actual annual data available. The total cost of all material management is estimated as $62,452, found on the second worksheet at the bottom of the budget pro-forma. Also found on this worksheet, are the following average "base case" costs: $55.73/ton of MSW managed; $32.97/ton of recyclable materials managed; and $51.74/ton for all materials managed.
7. Year One of proposed changes - Data interpretation: (***Please refer to Attachment A – Worksheets One & Two***). The first year of proposed changes is reflected in the second column, throughout the model. This column includes: a) the addition of six collections of the 30 cu. Yd. dome-top mixed paper collection container; b) reduction of the size of the two compactors for MSW from 35 cu. Yds. To 20 cu. and c) reduction of compactor to collections from a scheduled 52/year to about 21/year, on an on-call basis. The total cost of all material management is estimated as $53,681, a reduction from the base case of $8,771. Also found on this worksheet, are the following average "Year one" costs: $48.29/ton of MSW managed; $30.46/ton of recyclable materials managed; and $44.60/ton for all materials managed.

Conclusions:

- Largest immediate benefit would derive from an improved MSW management contract and disposal oversight, which may be achieved by requesting the favorable

terms of the Mass OSD statewide waste management contract (ST1J391) from their current vendor.

- In the current contract environment, the financial incentive is clear to divert more paper and reduce fees devoted to waste collection and disposal.
- There would be a need for outreach and adjustments to in-building collection activities to support paper diversion success.
- The additional savings could be used to support educational outreach and distributed smaller containers or, in time, pilot comingled projects to help meet waste ban requirements.
- An on-call collection system, hauling only very full containers, may add additional savings that might be used to offset additional incremental expense of paper collection infrastructure.